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REMARKS

Claim Rejections - 35 USC §102

Claims 1-3, 5-8 and 10 are rejected under 35 U.S.C. § 102(b) as being anticipated by Schmatz et al. (U.S. Patent No. 5,096,110, hereinafter "Schatz").

Schatz discloses a control system and method of vacuum brazing of aluminum workpieces in a vacuum chamber wherein the combination of the partial pressure of water and the partial pressure of oxygen is adjusted to be within a determined desired combination pressure range as a function of the temperature within the chamber as the workpieces are heated up to a temperature of about 500°C.

Regarding independent claims 1 and 6, Applicants respectfully traverse the rejections since the Applicants' claimed combination, as exemplified in claim 1, includes the limitations not disclosed in Schmatz of:

"replacing air around an unsoldered part with a first inert gas;
removing the first inert gas to form a vacuum around the unsoldered part;
vacuum reflow soldering the unsoldered part to form a reflow-soldered part;
providing a second inert gas to fill the vacuum around the reflow-soldered part; and
replacing the second inert gas with air around the reflow-soldered part."

The Examiner states:

"Schatz teaches a system for soldering a part comprising a means for replacing air around an unsoldered part with inert gas, means for replacing the gas with vacuum and means for backfilling the vacuum with gas and air which can be used for cooling. The gases are presumably the same (figure 1 and col 3 line 43 - col 4 line 8)."

Applicants respectfully disagree. It is respectfully submitted that Schmatz does not disclose using a vacuum or inert gas as claimed but instead discloses using the vacuum furnace of Schmatz FIG. 1 to control the combination of partial pressures of oxygen and water (Schatz column. 3, line 43, through column 4, line 8), which states:

"The system of the present invention further includes heating means, for controllably heating the workpieces within the vacuum chamber at a variable chosen heating rate, and pumping means for removing gases from the vacuum chamber.

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...The processor means includes: ... (iv) adjustment means responsive to the control signal for adjusting the combination of the partial pressure of oxygen and the partial pressure of water in the chamber to correspond to an acceptable combination pressure as a function of the sensed temperature, comprising means for controlling the pumping means and the heating means. ...” [deletions and underlining for clarity]

Based on the above, it is respectfully submitted that claims 1 and 6 are allowable under 35 USC §102(b) as not being anticipated by Schmatz because:

“Anticipation requires the disclosure in a single prior art reference disclosure of each and every element of the claim under consideration.” W.L. Gore & Assocs. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983) (citing Soundsciber Corp. v. United States, 360 F.2d 954, 960, 148 USPQ 298, 301 (Ct. Cl.), *adopted*, 149 USPQ 640 (Ct. Cl. 1966)), *cert. denied*, 469 U.S. 851 (1984). Carella v. Starlight Archery, 804 F.2d 135, 138, 231 USPQ 644, 646 (Fed. Cir.), *modified on reh’g*, 1 USPQ 2d 1209 (Fed. Cir. 1986); RCA Corp. v. Applied Digital Data Sys., Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984).

Regarding claims 2-3 and 5, these dependent claims depend from independent claim 1 and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations including:

“the first and second inert gases are the same gas;
vacuum reflow soldering comprises heating around an integrated circuit package on a printed circuit board having solder paste printed thereon at a plurality of different temperatures in the vacuum; or
moving an integrated circuit package on a printed circuit board in at least one direction of horizontally, vertically, and a combination thereof from replacing the air, removing the first inert gas, reflow soldering, providing the second inert gas, through replacing the second inert gas.”

Schmatz column. 3, line 43, through column 4, line 8, *supra.*, discloses that inert gases are not disclosed, a brazing process is disclosed and not reflow soldering, and no movement is disclosed among different processes, which are also not disclosed.

Regarding claims 7-8 and 10, these dependent claims depend from independent claim 6 and are believed to be allowable since they contain all the limitations set forth in the

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independent claim from which they depend and claim additional unobvious combinations including:

“vacuum reflow soldering provides the integrated circuit package on the printed circuit board having solder bumps with 90% of the solder bumps formed having less than 10% empty voids and 10% of the solder bumps having less than 20% empty voids as a percentage of volume;

vacuum reflow soldering comprises heating around the integrated circuit package on the printed circuit board having solder paste printed thereon at a plurality of different temperatures in the vacuum; or

moving the integrated circuit package on the printed circuit board in at least one direction of horizontal, vertical, and a combination thereof.”

Schmatz column. 3, line 43, through column 4, line 8, *supra.*, discloses that a brazing process is disclosed and not reflow soldering, no disclosure is made of a solder, no disclosure is made of an integrated circuit package or printed circuit board, and no movement is disclosed of movement of an integrated circuit package.

Based on all of the above, it is respectfully submitted that claims 1-3, 5-8 and 10 are allowable under 35 U.S.C. §102(b) as not being anticipated by Schmatz because:

“If the reference fails to teach or suggest even one limitation of the claimed invention, then the claim is not anticipated.” *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1574, 224 U.S.P.Q. 409, 411 (Fed. Cir. 1984).

Claims 1-20 are rejected under 35 U.S.C. § 102(b) as being anticipated by Gieskes (U.S. Patent No. 5,031,818, hereinafter “Gieskes”).

Gieskes discloses a soldering machine with a soldering chamber for the soldering process; a first lock chamber connecting to the soldering chamber; a second lock chamber connecting to the soldering chamber; two openings each arranged between a lock chamber and the soldering chamber; two openings each connecting a lock chamber to the outside wherein each opening is closable by a door; means for creating a vacuum in the lock chambers; means for transporting objects for soldering from the outside through the first lock chamber, the soldering chamber and the second lock chamber. The first lock chamber transfers an object for soldering to the solder chamber in a nitrogen filled environment (non-

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vacuum). After the soldering process, the object is transferred from the solder chamber to the second lock chamber still under a nitrogen filled environment.

Regarding independent claims 1, 6, 11, and 16, Applicants respectfully traverse the rejections since the Applicants' claimed combination, as exemplified in claim 1, includes the limitations not disclosed in Gieskes of:

"vacuum reflow soldering the integrated circuit package on the printed circuit board"

The Examiner states:

"Gieskes teaches a system for soldering a part comprising a conveyor for moving the part, means for replacing air around an unsoldered part with inert gas, means for replacing the gas with vacuum, means for replacing the vacuum with gas which can be used for cooling, multiple lock chambers, a vacuum reflow chamber and a pump for injection and removal of gas (figure 1, col 2 lines 47 and col 3 line 32 – col 4 line 15). The gases are presumably the same. As the soldering is performed in a vacuum, the apparatus is capable of forming solder bumps with very low void volumes. Although the reference teaches soldering of a circuit board, it is noted that the object soldered does not further limit the apparatus."

Applicants respectfully disagree. It is respectfully submitted that Gieskes does not disclose the claimed vacuum reflow soldering in Gieskes FIG. 1, col. 2, line 47, and col. 3, line 32 – col. 4, line 15. Gieskes actually states in Gieskes col. 3, line 32, - col. 4, line 17:

"Finally, FIG. 5 shows...

Hereafter a vacuum is created in the lock chamber 4 by means of a vacuum pump (not shown in the drawings)...

Nitrogen is...injected into the lock chamber...in order not to cause any pressure waves. ... The object for soldering...enters the soldering chamber 3. Here it is subjected to a soldering operation...

The first object, which has been subjected...to the soldering process, moves...to the lock chamber 5... When the object has left the lock,...a vacuum is created to remove influx air.

No object will be situated in the last vacuum chamber when the vacuum is created." [deletions and underlining for clarity]

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Gieskes instead discloses the soldering process performed in a non-vacuum environment (nitrogen) as more fully explained in Gieskes column 3, line 65 through column 4, line 5, which states:

"Nitrogen is subsequently injected into the lock chamber, this to a pressure such that there is no longer any difference in pressure between the soldering compartment 3 and the lock chamber 4, in order not to cause any pressure waves. Thereafter the door 11 is moved downward. The object for soldering is then moved by the conveyor belts through the opening in the wall 6 and enters the soldering chamber 3. Here it is subjected to a soldering operation." [underlining for clarity]

Based on the above, it is respectfully submitted that claims 1, 6, 11, and 16 are allowable under 35 U.S.C. §102(b) as not being anticipated by Gieskes because:

"Anticipation requires the disclosure in a single prior art reference disclosure of each and every element of the claim under consideration." W.L. Gore & Assocs. v. Garlock, Inc., *supra*.

Regarding claims 2-5, these dependent claims depend from independent claim 1 and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations including:

"vacuum reflow soldering comprises heating around an integrated circuit package on a printed circuit board having solder paste printed thereon at a plurality of different temperatures in the vacuum;
removing the first inert gas includes simultaneously heating an integrated circuit package on a printed circuit board having solder paste printed thereon at a plurality of different temperatures and replacing the second inert gas includes simultaneously cooling the integrated circuit package on the printed circuit board having solder thereon at a plurality of different temperatures; or
moving an integrated circuit package on a printed circuit board in at least one direction of horizontally, vertically, and a combination thereof from replacing the air, removing the first inert gas, reflow soldering, providing the second inert gas, through replacing the second inert gas."

Gieskes column 3, line 65 through column 4, line 5, *supra*., does not disclose a vacuum reflow soldering and specifically states in Gieskes column 4, lines 16-17:

"No object will be situated in the last vacuum chamber when the vacuum is created."

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With regard to claim 7-10, these dependent claims depend from independent claims 6 and are believed to be allowable since they contain all the limitations set forth in the independent claims from which they depend and claim additional unobvious combinations including:

“vacuum reflow soldering provides the integrated circuit package on the printed circuit board having solder bumps with 90% of the solder bumps formed having less than 10% empty voids and 10% of the solder bumps having less than 20% empty voids as a percentage of volume;

vacuum reflow soldering comprises heating around an integrated circuit package on a printed circuit board having solder paste printed thereon at a plurality of different temperatures in the vacuum;

removing the first inert gas includes simultaneously heating the integrated circuit package on the printed circuit board having solder paste printed thereon at a plurality of different temperatures, and replacing the second inert gas includes simultaneously cooling the integrated circuit package on the printed circuit board having solder thereon at a plurality of different temperatures in the unloading unit after moving the integrated circuit package on the printed circuit board in the first move;”

Gieskes column 3, line 65 through column 4, line 5, *supra.*, does not disclose a vacuum reflow soldering, does not disclose solder bumps having ranges of empty voids, does not disclose pluralities of different temperatures, and does not disclose cooling.

With regard to claim 12-15, these dependent claims depend from independent claims 11 and are believed to be allowable since they contain all the limitations set forth in the independent claims from which they depend and claim additional unobvious combinations including:

“the reflow unit comprises a heating unit for heating at a plurality of different temperatures the unsoldered part in the vacuum;

the loading lock includes a pump for removing the first inert gas and a heating unit for simultaneously heating at a plurality of different temperatures the unsoldered part, and the unloading lock includes a supply of inert gas for replacing the second inert gas and a heating unit for simultaneously cooling at a plurality of different temperatures the reflow-soldered part;”

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Gieskes column 3, line 65 through column 4, line 5, *supra.*, does not disclose a vacuum reflow soldering, does not disclose pluralities of different temperatures, and does not disclose cooling.

With regard to claim 17-20, these dependent claims depend from independent claims 11 and are believed to be allowable since they contain all the limitations set forth in the independent claims from which they depend and claim additional unobvious combinations including:

“the reflow unit provides the integrated circuit package on the printed circuit board having solder bumps with 90% of the solder bumps formed having less than 10% empty voids and 10% of the solder bumps having less than 20% empty voids as a percentage of volume;

the reflow unit comprises a heating unit for heating the integrated circuit package on the printed circuit board having solder paste printed thereon at a plurality of different temperatures in the vacuum after moving the integrated circuit package on the printed circuit board from the loading lock;

a loading unit for providing an unsoldered integrated circuit package and an unsoldered printed circuit board to the loading lock, the loading lock [for heating at a plurality of different temperatures the integrated circuit package on the printed circuit board having solder paste printed thereon after moving the unsoldered integrated circuit package on the unsoldered printed circuit board from the loading unit, the unloading lock for cooling at a plurality of different temperatures the soldered integrated circuit package on the soldered printed circuit board in the unloading lock after moving the integrated circuit package on the printed circuit board from the loading lock, and an unloading unit for receiving a soldered integrated circuit package and soldered integrated circuit board from the unloading lock; or

a conveyor system for moving in horizontal, vertical, and a combination thereof the integrated circuit package on the printed circuit board.”

Gieskes column 3, line 65 through column 4, line 5, *supra.*, does not disclose a vacuum reflow soldering, does not disclose solder bumps having ranges of empty voids, does not disclose pluralities of different temperatures, and does not disclose cooling.

Based on the above, it is respectfully submitted that claims 1-20 are allowable under 35 U.S.C. §102(b) as not being anticipated by Gieskes because:

“A claim is anticipated only if each and every element *as set forth in the claim* is found, either expressly or inherently described, in a single prior art

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reference. (Kalman v Kimberley Clark Corp., 713 Fed. 2nd 760, 771, 218 USPQ 781, 789 (Fed. Circ. 1983), *Cert. Denied*, 465 U.S. 1026, 224 USPQ 520, 1984.)”

Response to Arguments

The Examiner stated that Applicant's arguments with respect to claims 4, 9 and 11-20 have been considered but are moot in view of the new grounds of rejection.

Based on the above, it is respectfully submitted that claims 1, 6, 11, and 16 are allowable under 35 U.S.C. §102(b) as not being anticipated by Gieskes because:

“Anticipation requires the disclosure in a single prior art reference disclosure of each and every element of the claim under consideration.” *W.L. Gore & Assocs. v. Garlock, Inc.*, supra.

The Examiner states:

“In response to applicant's argument that Schmatz does not disclose using a vacuum or inert gas as claimed, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim...”

Therefore the 102 rejection of claims 1-3, 5-8 and 10 as anticipated by Schmatz stands.”

Applicants respectfully submit that claims 1-3, 5-8, and 10 recite a process and do not claim an intended use. Further, as stated by the U.S. Supreme Court, a process can only be anticipated by a similar process:

“A process...is not anticipated by [a prior art] mechanism which might with slight alterations have been adapted to carry out that process, unless, at least, such use of it would have occurred to one whose duty it was to take practical use of the mechanism describe. In other words, a process patent can only be anticipated by a similar process. A mechanical patent is anticipated by a prior device of like construction and capable of performing the same function; but it is otherwise with a process patent.” *Carnegie Steel Co. v. Cambria Iron Co.*, 185 U.S. 403 (1902).

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The Examiner also states:

"If the prior art structure is capable of performing the intended use, then it meets the claim. Schmatz teaches a vacuum system comprising a pump capable of removing air and a backfill gas system capable of replacing air (col 6 lines 31-65). This removal of air is capable of reducing void formation."

Schmatz is not capable of meeting the intended use because it is used to reduce pressure to control the combination of partial pressures of oxygen and water while heating an object to brazing temperature (Schmatz col. 3, line 43, through col. 4, line 8), *supra*.

Further, the U.S. Supreme Court holding that a process can only be anticipated by a similar process of Carnegie Steel Co. v. Cambria Iron Co., *supra*, is applicable here.

The Examiner further states:

"It is noted that the claims refer to a system not a method or process."

The Applicants respectfully submit the above note is incorrect as to claims 1-10 because the Random House Webster's College Dictionary, p. 1356, Random House Inc., c. 1996, 1995, 1992, 1991, defines "system" as:

"5. any formulated, regular, or special method..." [underlining and deletion for clarity]

The above is confirmed by Merriam-Webster OnLine at <http://www.m-w.com/dictionary/system> where a synonym for "system" is "method".

In addition, it is respectfully submitted that the above note is incorrect as to claims 11-20 because the Random House Webster's College Dictionary, p. 1356, Random House Inc., c. 1996, 1995, 1992, 1991, defines "system" as:

"1. an assemblage...of...parts forming a complex or unitary whole"
[deletions and underlining for clarity]

The above is confirmed by Merriam-Webster OnLine at <http://www.m-w.com/dictionary/system> where a "system" is defined as:

"a group of devices...for...serving a common purpose..."

Therefore, a "system" for claims 1-20 includes both a method and an apparatus.

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Other

The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure.

The prior art made of record by the Examiner have been considered and are not believed to disclose, teach, or suggest, either singularly or in combination, Applicants' invention as claimed.

Conclusion

In view of the above, it is submitted that the claims are in condition for allowance and reconsideration of the rejections is respectfully requested. Allowance of claims 1-20 at an early date is solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including any extension of time fees, to Deposit Account No. 50-0374 and please credit any excess fees to such deposit account.

Respectfully submitted,



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